

RESEARCH PAPER



Understanding actor perspectives regarding challenges for integrated river basin management

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ABSTRACT

Integrated river basin management increases technical as well as management and governance complexity. In this multidisciplinary setting, actors, from their different backgrounds, frame both issues and solutions differently. To resolve conflicts, it is important to recognize – and to not ignore – the existence of contending social framings. A better understanding is needed of how actors frame issues and solutions in integrated river basin management. To gain this better understanding, semi-structured interviews were conducted with Dutch river basin management actors following Sense-making methodology. Three challenges were identified where respondents framed both the issue and solution differently: (1) creating flexibility in a controlled river system; (2) sustaining the integrated approach in the maintenance of floodplains; and (3) formulating future river basin management policies to adapt to climate change. Cultural Theory was subsequently used to analyse how respondents construct perspectives towards these challenges. The analysis showed how actors use different rationalities in constructing these perspectives. As an implication, it is important for actors to recognize and acknowledge these perspectives in integrated river basin management decision-making. New tools, embedded in learning environments, are needed to facilitate exchanging and understanding actors' perspectives.

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Introduction

Integrative management approaches are increasingly common in river basin management (Mitchell 1990, 2005, Watson 2004, Pahl-Wostl *et al.* 2008, Rijke *et al.* 2012, Fliervoet *et al.* 2013). Such approaches, commonly referenced to as integrated river basin management, in general acknowledge the interrelationships between water – both quality and quantity – and other variables such as land use. Therefore, integrated river basin management requires a holistic or systems approach to address issues (Mitchell 1990, 2005, Watson 2004, Rijke *et al.* 2012). Two interpretations of a holistic or systems approach exist. First is the *comprehensive* interpretation, which addresses a system at its largest scale – e.g. river basin – and includes all possible variables and their relationships. Second is the *integrative* interpretation, which takes a more focused approach by selecting the key variables and their relationships that determine the most variability in the system. As Watson (2004) explains, more recent forms of integrated river basin management use the integrative interpretation to avoid conceptual, analytical and managerial challenges posed by the comprehensive interpretation. The integrative interpretation is defined by Rijke *et al.* (2012, p. 371) as an approach that 'aligns multiple objectives in a river basin across different spatial scales and temporal dimensions'.

In The Netherlands, integrated river basin management is found in the 'Room for the River programme' (RfR) and the 'Delta Programme' (DP). In these programmes, flood risk

management targets have been combined with objectives on, for example, nature restoration, recreation and agriculture (Rijke *et al.* 2012, van Herk *et al.* 2012, Klijn *et al.* 2013). Moreover, these programmes have shifted Dutch river basin management from protecting against water with dikes to accommodating water with spatial measures such as side-channels and dike relocations, placing more emphasis on spatial development (Wiering and Arts 2006, Wolsink 2006). Such integrated river basin management approaches are not limited to the Netherlands and can be observed in many developed countries (see Warner *et al.* 2013).

Consequently, integrative approaches introduce actors from non-water related disciplines to river basin management. As a result, decision-making in integrated river basin management has become much more multidisciplinary, collaborative and complex (Pahl-Wostl 2006, Dewulf *et al.* 2015, Margerum and Robinson 2015). Previous studies have shown a need for understanding how actors frame issues in such decision-making settings (Curtis *et al.* 2002, Gray 2004, Mostert *et al.* 2008). Following Goffman (1974), actors frame issues in order to organize their own understanding of the issue and to subsequently guide future action. If actors do not recognize and acknowledge other actors framing issues differently, it becomes difficult to reach a shared solution (Thompson 1997, Gray 2004, Mostert *et al.* 2008). The importance is therefore to recognize the existence of conflicting frames, develop an understanding of these frames and develop responses that take all relevant frames into account.

This paper contributes to obtaining a better understanding of how issues and solutions in integrated river basin management are framed differently by involved actors and serves as a preparatory step for the development of a serious game. Serious games are generally referenced to as games developed for a purpose other than entertainment (Michael and Chen 2006, Susi *et al.* 2007). The word ‘serious’ reflects this other purpose – i.e. education, decision-making or developing public policy – not the content of the game or how it is played.

To gain the understanding of how issues and solutions are framed, three research questions are addressed in this paper: (1) what are current complex challenges perceived by river basin management actors; (2) what are river basin management actors’ envisioned resolution strategies to address these; and (3) what are river basin management actors’ underlying perspectives towards these challenges? To investigate the research questions, semi-structured interviews were conducted with river basin and floodplain management actors. To explore the first and second research question, Dervin’s Sense-making methodology was applied. Thereby, the interviews were set up and conducted following a user-centred, constructivist approach with a focus on both challenges and proposed resolution strategies from the respondents’ point of view. To explore the third research question, the perspectives that respondents expressed towards these challenges were analysed using Cultural Theory.

Theoretical framework

Sense-making methodology

Dervin’s Sense-making is a generalizable methodology for studying how individual actors construct meaning – or in effect frame – their surroundings (Dervin 2003). First, it assumes the actor is an expert in his or her world while acknowledging that other expertise exists which may be useful. Second, it assumes that the actor is a theorist in his or her world and therefore has hunches, hypotheses, and generalizations about how things are connected and how power flows (Dervin 1999). As a user-centred approach, Sense-making focuses on identifying what individual actors “‘really” think, feel, want [and] dream’ (Dervin 1998, p. 39). In relation to natural resources management, Romanello (2003) executed Sense-making interviews and asked natural and social scientists to describe specific discussions over climate issues in which disagreement occurred. This application of Sense-making focuses on analysing how individual actors think, feel and question certain situations. Sense-making methodology was

applied similarly in this study, informing the interview approach, one of the three different ways to apply Sense-making as a method (Dervin 1999). Moreover, Sense-making was used to allow a respondent to put forward, construct and frame challenges as well as resolution strategies based on his or her own world.

In the interviewing method, Sense-making attends to constructivist assumptions by paying ‘empirical attention’ to the world of the respondents rather than the world of the researcher (Dervin 2003). The respondent is seen as facing a *gap* arising out of a *situation* that prevents him or her from reaching a desired *outcome*. The gap needs to be *bridged* in order to reach this outcome (Naumer *et al.* 2008, Dervin and Foreman-Wernet 2012). This way, Sense-making interviews incorporate a deliberate design that invites respondents to bridge gaps by drawing their own connections ‘between past and present, present and future; relationships and impacts of power; the very value of formal information or lack of it’ (Dervin 1999, p. 746).

Cultural theory and perspectives

Cultural Theory (CT), as described by Thompson *et al.* (1990), explains how ‘ways of life’ – social structures – maintain themselves – or fail to do so – following social-cultural viability. A main assumption behind the theory is that specific cultural profiles can be linked to individual perceptions. CT is based on two social dimensions coined by Douglas (1970): (1) whether an individual’s behaviour is influenced by external rules (‘grid’); and (2) whether an individual feels strongly about belonging to a group (‘group’). Following these social dimensions as a 2 × 2 matrix, CT distinguishes four ways of life often referred to as rationalities: hierarchist, egalitarian, individualist and fatalist. Each rationality has its own ideal (stereotypical) world view, which are summarized in Table 1.

According to CT, these four world views act as ‘lenses’ through which individuals observe the world as well as drive action. The theory therefore recognizes that individuals and social groups act differently under similar circumstances following differences in their underlying beliefs and values. Thompson *et al.* (1990) extended the grid-group based approach to the environmental domain, adding views on nature, resources and attitude towards risk to each rationality. Subsequently, CT has been applied in public policy studies in order to understand how both individuals and groups both interpret and address environmental challenges such as climate change (Verweij *et al.* 2006), environmental problems

Table 1. Overview of the world views of the cultural theory rationalities.

Cultural Theory rationality	World view
Hierarchist	<ul style="list-style-type: none"> • Pursues a structured world with strong governmental responsibilities, laws and regulations • Believes in strong structures where rules are followed and authorities obeyed • Looks to establish stability in and controllability of the world
Egalitarian	<ul style="list-style-type: none"> • Pursues a collective world wherein humans live in equality with each other and in harmony with nature • Believes in strong communities with moral and ethical principles • Looks to establish trust, cooperation and consensus
Individualist	<ul style="list-style-type: none"> • Pursues a highly technological world based on innovations, opportunities and economic growth • Believes in freedom, efficiency and self-determination • Looks to establish a free market and to take risks that offer rewards
Fatalist	<ul style="list-style-type: none"> • Pursues a world where people are not occupied in worrying about the future • Believes in the unpredictability of the world and the lack of possibility to change anything for the better • Does not look to establish anything, instead asks ‘why bother?’

related to car use (Steg and Sievers 2000), and renewable energy (West *et al.* 2010).

CT has also been extended to Dutch water and river basin management (Hoekstra 1998, Van Asselt *et al.* 2001, Middelkoop *et al.* 2004, Valkering *et al.* 2009; Offermans 2012). In this extension, most scholars focused on hierarchism, egalitarianism, and individualism – the active rationalities – as fatalism – the passive rationality – withdraws itself from policy-making (asking: ‘why bother?’). Building on their work, the ‘lenses’ of CT’s three active rationalities in relation to Dutch river basin management are summarized in Table 2.

As for the application of CT to Dutch water and river basin management, Hoekstra (1998) applied CT to develop perspectives on water based on the lenses of each way of life and subsequently derived future scenarios from these perspectives. Somewhat similar, Middelkoop *et al.* (2004) used CT to develop integrated scenarios for water and river basin management based on perspectives. In this approach, a perspective is a consistent and coherent description of (1) how the world functions (world view); and (2) how policy should be carried out (management style).

Offermans (2012) developed the Perspective Method to analyse the role of perspectives and perspective change in river basin management. In this method, perspectives are derived by measuring positions – one for each active rationality – for a set of beliefs. For example, on the belief of water system organization, the hierarchist’s position is control and regulation, the egalitarian’s position is natural development and resilience and the individualist’s position is opportunism and innovative technologies. Contrary to Middelkoop *et al.* (2004), perspectives in the approach of Offermans (2012) are therefore not stereotypical; they can be heterogeneous by consisting of positions from multiple rationalities. The operationalized ‘Perspective Method’ – a set of 15 beliefs and according positions – was used in combination with a serious game to measure participants’ perspectives and perspective change in game sessions (Valkering *et al.* 2012). In this study, CT was applied similarly to Offermans (2012); using a set of beliefs to analyse the perspectives that river basin management actors take towards challenges. The appendix provides an overview of beliefs and the respective positions that each rationality takes.

Integrated river basin management in the Netherlands

Following near-flood events of the Rhine and Meuse rivers in both 1993 and 1995, Room for the River (RfR) was developed as new national policy with a double objective of

increasing flood safety through spatial measures and improving the spatial quality of the riverine area by incorporating multiple objectives on other river functions (Rijke *et al.* 2012, van Herk *et al.* 2012, Klijn *et al.* 2013). Consequently, actors from disciplines such as spatial planning, ecology, and business have been introduced to Dutch river basin management, increasing its complexity (Wiering and Arts 2006, Wolsink 2006, van Herk *et al.* 2012). Through RfR’s integrative approach, many floodplain areas have been developed as nature or cultural landscapes areas. As a result, the Dutch rivers and floodplains have been transformed from the former single function of agriculture into multifunctional riverine landscapes (Pahl-Wostl 2006, Fliervoet and Van den Born 2017). 39 projects have been executed under the RfR programme, most of which are either completed or nearly completed at the time of writing. RfR projects are therefore transitioning to their respective maintenance phases (Fliervoet and Van den Born 2017).

The Delta Programme (DP) on the other hand is setting out the medium to long-term strategy (2050–2100 outlook) of Dutch water management in response to climate change (Deltacommissaris 2011). In the context of its river component, DP is using RfR as an example for both collaborative and integrative strategies (Rijke *et al.* 2012). Similar to RfR, DP seeks to combine increasing flood safety with spatial quality.

However, for DP spatial quality is not a secondary objective in itself and therefore not fully funded by the government. Rather, it seeks to combine flood safety measures with spatial development that other actors – i.e. provincial governments, municipalities or NGOs – would like to see and contribute to financially. A second major difference between RfR and DP’s river component is that where RfR only looked at spatial riverine measures, DP combines spatial measures with dike reinforcements. At the time of writing, the first short-term projects are being implemented which focus on dike reinforcements and the long-term strategy is in its plan-making phase.

Methodology

To answer the research questions, interviews with a variety of river basin management actors were conducted using a semi-structured protocol. Using the Sense-making interview method allowed respondents to focus on self-identified challenging situations and to construct their own views. To subsequently analyse these views, Cultural Theory was used to analyse these views and generate perspectives. The interviews were set up and executed in four phases:

Table 2. Lenses of cultural theory’s three active rationalities in relation to Dutch river basin management.

Cultural Theory way of life	Views on river basin management
Hierarchist	<ul style="list-style-type: none"> • Stands for government regulation and control of both water and nature • Pursues sustainable river basin management based on win-win solutions • Flood safety is the top priority while leaving some room for economic and natural development • Decision-making should be based on expert set norms
Egalitarian	<ul style="list-style-type: none"> • Puts emphasis on the restoration of nature and ecology • Pursues sustainable river basin management where water and natural processes guide management strategies • Flood safety should be based on natural resilience • Decision-making should be based on participatory processes and participants in these processes should have an (more) equal voice
Individualist	<ul style="list-style-type: none"> • Stands for the free market and the use of the river for economic good • Pursues river basin management seeking innovative projects in pursuit of economic opportunities • Flood safety should be based on adaptation and innovation, viewing water as an opportunity • Decision-making should be based on the functioning of the free market and privatization

- (1) Background questions related to respondents' work activities, their own visions on flood safety management, nature management and floodplain management as well as current trends they are observing in river basin management.
- (2) Contextual questions related to a challenging situation – identified by the respondents themselves – such as goals they had, other actors they worked with and actions they took.
- (3) Specific questions related to the identified challenging situation such as what struggles they have or had, what concerned them and what questions they would like to see answered.
- (4) Envisioning questions related to resolution strategies to the identified challenging situation such as what would be their preferred outcome, what would help them achieve it and what would they do if given a magic wand.

Selection of respondents

Respondents were invited to participate using Table 1 from Fliervoet and Van den Born (2017) on different river basin and floodplain management organizations as a starting point. Next, respondents were invited based on the criteria that they (1) have more than five years of experience in river and floodplain management; and (2) have a position with decision-making power in their organization. The first criterion ensured that respondents have ample experience with the RftR policy and its integrative approaches. The second criterion ensured that respondents are involved in decision-making, both within their respective organization and between organizations.

In total, 15 interviews were conducted, in each case by one interviewer; the first author of this paper. Table 3 provides an overview of the interview respondents, the different organizations they represent, and a categorization of their function.

One interview was conducted with two representatives of the same nature development organization (interview #2). The interviews were conducted face-to-face at the offices of the respondents. Thirteen respondents were male, three were female, which is representative for the gender division in the field. The interviews were executed between the 15 July 2016 and the 18 November 2016, lasted between 47 and 124 minutes, with an average of 80 minutes per interview, and were recorded to transcribe and code.

Data analysis

The interviews were analysed in two steps. The first step concerned deductive coding following Miles and Huberman (1994). The first author acted as first coder and the second author as second coder. The first coder developed a coding scheme in iterations, which resulted in 12 themes and 66 categories below these themes. This scheme was subsequently used by both the first and second coder to code the interviews. Afterwards, memos were created to structure and analyse the information within themes and categories, structure links between categories as well as structure the respondents' answers and opinions. This way, current river basin management challenges were identified and respondents' envisioned resolution strategies analysed, answering the first and second research questions.

To answer the third research question, the identified challenges were considered as a situation in which the

respondents acted. Cultural Theory (CT) was subsequently used to understand how respondents view and address these situations based on how respondents' opinions, expressions of belief, and proposed resolution strategies reflected CT's rationalities. As explained by Hartmann (2011, p. 41), the same respondent may act according to hierarchical rationality in one situation, but follow the individualist rationality in another. The analysis therefore does not assign one or multiple rationalities to a respondent, but analyses how they act in regard to these situations. In the presented results, these views of respondents are presented as generalized perspectives. As such, these do not necessarily reflect CT's stereotypical rationalities; the perspectives can be non-stereotypical and reflect multiple rationalities. This approach was taken as the study analyses the reality of the identified challenges and in reality, both individuals and organizations do not follow CT's stereotypes, but rather follow beliefs of multiple rationalities (Thompson *et al.* 1990, Verweij *et al.* 2006, Billgren and Holmén 2008). It was assumed that underlying beliefs and values at the individual level are equally found at the organizational level. The analysis approach taken resembles the operationalized Perspective Method of Offermans (2012), extending her 15 beliefs to a larger set of 53 relevant beliefs and positions of CT's rationalities in relation to Dutch river basin management based on Hartmann (2011); Hoekstra (1998); Middelkoop *et al.* (2004); Offermans (2012); Thompson *et al.* (1990); Valkering *et al.* (2011); and Van Asselt *et al.* (2001). The overview of these beliefs and positions can be found in the appendix. This overview was used as a coding scheme for the memos related to each identified challenge in the first analysis step to construct respondents' perspectives.

Results: identified challenges and diverging perspectives

Three challenges were identified in the interview analysis: (1) the challenge of creating flexibility in a controlled river system; (2) the challenge of sustaining the integrated approach in the maintenance of floodplains; and (3) the challenge of future river basin management policies to adapt to climate change. Below, each challenge is presented, combined with respondents' resolution strategies as well as generalized perspectives.

The challenge of creating flexibility in a controlled river system

The rivers in the Netherlands are considered a controlled system; the rivers are canalized and the hinterland is protected from extreme river discharges by floodplains and dikes. In Room for the River (RftR), the primary objective focused on creating space for water as a flood safety strategy and the secondary objective of developing spatial quality put more emphasis on the rivers' floodplains by applying spatial measures as well as focusing on nature restoration. Here, respondents displayed diverging perspectives on how to manage the floodplains and specifically floodplains allocated to nature restoration. As multiple respondents explained, the main idea for these newly created nature areas is to let natural dynamics run their course up to a certain extent. But how do respondents approach management of these areas in an otherwise controlled river system?

Table 3. Interview respondents and their organizations.

Interview number	Organization	Organization's focus in river basin management	Role in organization	Categorized Function	Experience in current function (years)
1	Agricultural Nature Association Rivierenland	Agriculture in combination with some nature management	Board member & farmer in a floodplain	Local agricultural manager	30
2	ARK Foundation Nature development organization	Nature management	1. Project leader & river team member. 2. Project leader (retired)	Regional nature managers (2)	11 & 24
3	Municipality of Deventer	Local government	Environment & maintenance manager	Local governmental manager	5
4	Dutch Delta Programme Rivers	Flood safety management (long-term planning)	Programme coordinator Delta Programme Rhine river	Regional governmental manager	2 ^a
5	Geldersch landscape and castles foundation	Nature management & cultural heritage	Region manager for the west region of the province of Gelderland	Regional nature manager	15
6	Ministry of Infrastructure and Environment	National government, policy-making towards flood safety	Senior policy advisor	National governmental manager	12
7	Ministry of Economic Affairs	National government, policy-making towards nature management	Manager river nature ambition	National governmental manager	13
8	Municipality of Nijmegen	Local government	Contract manager & maintenance advisor	Local governmental manager	7
9	Provincial Government of Gelderland	Regional government, setting up and stimulating nature development goals	Programme leader region development	Regional governmental manager	21
10	Rijkswaterstaat, Dutch Public Works Authority	Flood safety management & managing the rivers' navigability	Senior advisor flood safety	National water manager	28
11	Rijkswaterstaat, Dutch Public Works Authority	Flood safety management & managing the rivers' navigability	Senior advisor Room for the River	National water manager	17
12	Rijkswaterstaat, Dutch Public Works Authority	Flood safety management & managing the rivers' navigability	Senior advisor water management	Regional water manager	7–8
13	Rijkswaterstaat, Dutch Public Works Authority	Flood safety management & managing the rivers' navigability	Senior advisor Room for the River	Regional water manager	9
14	Staatsbosbeheer, Dutch State Forestry Agency	Nature management	River ecology manager	National nature manager	9–10
15	Water board Rivierenland	Flood safety management (responsible for the dikes)	Flood safety specialist	Regional water manager	10

^aHeld previous functions related to river basin management at other organizations listed in this table.

The control perspective

In the control perspective, in particular water managers placed emphasis on creating clear boundaries on the extent of allowed natural dynamics in the nature areas. These respondents explained how allowing natural dynamics would cause vegetation to grow and hydraulic resistance of the floodplains to increase, limiting their discharge capacity. Therefore, respondents pointed out the necessity to keep vegetation in the floodplains under control. As one water manager explained: 'You do not want unwanted developments in the wrong locations. [...] How do you maximize natural dynamics on one hand and limit it for flood safety on the other?'.

As an example management solution to keep floodplain vegetation in control, respondents explained that the Public Works authority developed the so-called vegetation layer. This layer is a flood safety management instrument combining maps and rules, specifying what type of vegetation is allowed at which location in the floodplains. Basically, it establishes a norm for floodplain vegetation which may not be exceeded. As one water manager explained: 'The vegetation layer says how we, as the Public Works authority, allow vegetation to be in the floodplains'.

For the most part, respondents displayed the hierarchist rationality towards managing the floodplains in this perspective, showing a partial domination of nature, controllability as the desired system property and viewing the floodplains as controllable lands. The development of the vegetation layer is a response to safeguard the controllability of the system following the hierarchist rationality through institutionalizing as the risk-handling style and establishing thresholds that may not be exceeded.

The flexibility perspective

Where water managers in the control perspective emphasized the need for controllability of natural dynamics, nature managers and some governmental managers focused on allowing natural dynamics in the floodplains to run their course. Here, respondents explained how nature managers approach the floodplains radically different from water managers: 'Flood safety bases itself on the fixation of the current situation and the permitting of change. [Our] management is focused on system development that follows natural processes'. These respondents expressed that it is more important to plan ahead and make sustainable developments possible. Although they acknowledged that water discharge is the main function of the floodplains and that thus flood safety is leading and agree that nature in the floodplains requires regulation, they called for more integrative approaches rather than manage flood safety and nature separately. In doing so, their call followed the egalitarian rationality, although also acknowledging elements associated with the hierarchist rationality.

In pursuit of more integrative approaches, respondents called for more flexibility to manage the floodplains and especially the newly created nature areas, expressing critique towards the vegetation layer. Some pointed out that it is quite static and conserving, determining the type of vegetation on each square metre and that such square metre fixation is not compatible with nature management's focus on floodplain development. Respondents also explained that compensation for vegetation management is similarly specified to every square metre based on costs for cutting, pruning and

grazing for different vegetation types. Multiple respondents stated that this funding system is inflexible and counterproductive, not fitting with the approach for nature restoration focusing on system development. Combined, respondents subscribing to the flexibility perspective explained that the flood safety management methods are simply not compatible with nature management approaches: 'You can regulate what each square metre should look like and how we should maintain it, so they [the Public Works authority] fall back on the vegetation layer and that is the safe way to guarantee flood safety'.

In the flexibility perspective, multiple respondents displayed the egalitarian rationality towards managing the floodplains; long-term, sustainable and pro-active solutions combined with more emphasis on integral management, nature development and resilience.

An attempt to bring perspectives together

In order to meet calls for more flexibility in floodplain management, water managers explained that the Public Works authority developed so-called mixed-types in the vegetation layer which specifies that an area can consist of multiple vegetation types given a more or less fixed partition, for example, 10 percent of one type and 90 percent of the other. However, nature managers explained that these mixed-types do not provide them the flexibility as they are still presented with a spatial boundary; the mixed-types do not allow them to look for alternative measures to reduce the floodplain's hydraulic resistance outside the mixed-type's demarcated area. The solution presented here is the introduction of new norms with a flexible component, following the hierarchist rationality. From the control perspective, this safeguards flood safety while providing flexibility. Respondents subscribing to the flexibility perspective however stated that their desired flexibility is not obtained as the fundamentals of the vegetation layer are still incompatible with nature management approaches.

Proposing resolution strategies

Respondents proposed multiple resolution strategies towards obtaining flexibility for nature restoration in a controlled river system. Two categories of strategies were identified. In the first category, respondents focused on increasing adaptivity in floodplain management. All mentioned the conserving perspective in current water and nature policies and management methods as obstructing. As an example, subscribers to both perspectives proposed more intensive vegetation management activities executed at longer intervals. A water manager proposed to perform rigorous vegetation management every 10 years over the current less intensive and preserving annual approach, putting less strain on the Public Works authority to monitor and manage floodplain vegetation. Another water manager proposed a similar strategy towards floodplain management in general, proposing to evaluate plans on whether they solve the bigger problem rather than comply with all rules and regulations. This line of argumentation focuses on the governmental regulation and managing its scarce resources, in line with the hierarchist rationality. Alternatively, nature managers suggested that when floodplain vegetation causes an increase in hydraulic resistance but also has ecological value, it should be possible to look

for a solution – achieve water level reduction by reducing the hydraulic resistance – at a different location. They furthermore proposed to cut down vegetation altogether over reducing its hydraulic resistance to an acceptable level, mimicking natural processes that reset floodplain vegetation. More rigorous vegetation management is proposed by these nature managers as well, but in order to preserve developed nature in other locations. The line of argumentation here focuses on nature development where natural processes are guiding, following the egalitarian rationality.

In the second category, respondents discussed establishing integral river basin management organizations to replace the current fragmented governmental responsibilities. These respondents explained that these sectoral responsibilities are inefficient, counterproductive, and leading to polarization. In their resolution strategies, subscribers to the control perspective proposed to form a single governmental management organization, integrally responsible for the river and floodplains. While they focused on governmental responsibilities for this management organization, associated with the hierarchist rationality, all cited increasing management efficiency as the main driver, a view associated with the individualist rationality. In addition, a governmental manager also explicitly used another argument associated with the individualist rationality for the management organization: to pursue exploitation of the floodplain areas. Subscribers to the flexibility perspective also proposed to form single management organizations, however not necessarily governmental. They proposed floodplain management organizations on a more local or regional scale – single to a couple of floodplains – consisting of water and nature managers as well as local stakeholders. The proposed goals for these organizations are all in line with the egalitarian rationality: finding more sustainable and long-term solutions, creating more cohesion between water and societal aspects of river basin management and establishing more equality between stakeholders through participatory decision-making.

The challenge of sustaining the integrated approach in the maintenance of floodplains

Following the (near) completion of all RftR projects, many respondents reported on problems arising in the subsequent maintenance phase. Several respondents shared concerns that while RftR projects featured strong integral approaches in the plan-making, objectives might become impossible to achieve as a result of a lack of maintenance inclusion in plan-making. In the context of RftR, respondents pointed out a specific cause contributing to the lack of maintenance inclusion: the introduction of public tendering of floodplain areas. Before RftR, riverine projects were planned and implemented under the ownership of the Public Works authority with an intention to transfer floodplain ownership to a preselected terrain management organization. As a result of a state aid discussion, this transfer of ownership was no longer allowed. Instead, it had to be publicly tendered. Multiple respondents indicated that the introduction of public tendering during RftR added a market-oriented mechanism that worked against including maintenance in plan-making.

As an example, one RftR project discussed by multiple respondents was the Nijmegen-Lent project. A large project

combining a dike relocation and a side-channel in the river Waal at the city of Nijmegen. A water manager explained how the State Forestry Agency was the intended terrain management organization for the floodplain area of the project. When it became apparent that ownership would not be transferred to the State Forestry Agency, but had to publicly tender for it instead, they withdrew themselves from the advising committee. The water manager explained that the public tendering discussion was not limited to the Nijmegen project: ‘This change happened more or less during the plan-making of all RftR projects’. As a result, input from the State Forestry Agency towards maintenance in the project’s plan-making and implementation was lost. In this instance, the State Forestry Agency acted along the fatalist rationality, withdrawing from the decision-making all together.

In addition, respondents explained that the introduction of public tendering meant the Public Works authority would retain ownership of RftR project areas. Following budget cuts, a financial dependency was created for the Public Works authority to generate revenue from its assets. A governmental manager explained how the objectives towards public use of the floodplains determined in the plan-making might become impossible. An example is the planned use of the floodplain area for public events: the cost for using the terrain became 20 times more expensive as the organizers were suddenly charged market rates. As expressed by multiple respondents, the introduction of public tendering changed the rules towards RftR projects’ maintenance phases. In regard to this introduction of a market-oriented mechanism – associated with the individualist rationality – respondents displayed diverging perspectives.

The accepting perspective

On one side were water managers who focused their strategies on accepted public tendering as the given situation:

public tendering has become reality, thus we need to act accordingly. [...] But if you are an ecologist who deeply cares about the qualities of an area, then it is very painful to accept that these areas are no longer automatically transferred to the State Forestry Agency but are instead brought to the market, with the risk that a farmer will simply mow the grass, because that is a real possibility.

The same respondent proposed to bring areas to the market together with other stakeholders in order to at least agree on all the objectives pursued in the area. However, other stakeholders should financially contribute for pursuing goals – for example, nature development goals – which are not the responsibility of the Public Works authority.

Another water manager would like to see that in a couple of years’ time, an organization is found that performs maintenance activities and users are satisfied both with how the area has developed and how responsible authorities perform their roles, proposing more an ideal vision rather than a solution proposal. These respondents acted with the hierarchist rationality in regard to this challenge, but also showed elements of the fatalist rationality by accepting it is not going to change and stating it is not the responsibility of the Public Works authority. Their proposed resolution strategies mainly reflect the hierarchist rationality in the procedural and sectoral approaches and searching for win-win solutions.

The rejecting perspective

Nature and governmental managers, on the other hand, looked to either reduce the – in their eyes – negative effects of public tendering or to remove the mechanism altogether. These respondents were critical of the segregation of project phases and the introduction of public tendering: ‘You do not build a landscape for tomorrow, you build it for the future. [...] That means that you plan with maintenance in mind, not what others at time do, maintaining the plan’. The respondents specifically opposed the short-term contracts that public tendering introduced towards floodplain management. One nature manager explained how the six-year contracts are much less interesting for the respondent’s organization as they hold the philosophy to only manage terrains if they have durable ownership. These respondents expressed concerns following the egalitarian rationality towards public tendering such as negative consequences on sustainability as well as lack of long-term outlooks and pro-active strategies. One respondent proposed to make a governmental organization integrally responsible for the planning, implementation, and maintenance of a project in order to sustain integral approaches. Another respondent stated that higher administrative levels should determine that a different economic profit model should apply to the public tenders if needed to make sure objectives determined in plan-making remain attainable. Although these respondents expressed concerns following the egalitarian rationality, they turn towards the hierarchist rationality of governmental responsibility and regulation to deal with the undesired, negative consequences.

The challenge of future river basin management policies to adapt to climate change

In regard to future challenges, several respondents discussed climate change in relation to river basin management. Some water and governmental managers extensively focused on the challenge of future river basin management policies to adapt to climate change. The challenge is related to the Delta Programme (DP), which, as explained in the background section, uses RftR as an example for its river component. However, respondents pointed out two major differences, differences which currently lack specifications. Firstly, RftR’s two objectives on flood safety and spatial quality were paid for by the same actor: the Dutch national government. DP instead looks at ‘combining efforts’; if an opportunity arises to combine spatial developments, other actors are asked to contribute financially. As a governmental manager stated: ‘This causes a discussion on cost sharing and that is of course a whole other principle than we had in RftR’.

Secondly, a different approach to flood safety management is taken in DP. Whereas RftR only looked at spatial measures for its flood safety measures, DP looks to, as respondents summarized, ‘develop a powerful combination of spatial measures and dike reinforcements’. However, they pointed out that DP does not include a specification of how much spatial measures or dike reinforcements should each contribute to DP’s objective of flood safety. As a water manager explained:

You can achieve flood safety targets with dike reinforcement and with spatial measures. And which targets you solve with which kind of measures is not specified. In RftR it was simple, you reach all targets through spatial measures unless it is impossible to reach this way.

The preference strategy

Combined, respondents discussed how these two non-specifications are causing uncertainty in the development of future river basin management plans. As an example, a province was asked to develop a ‘preference strategy’; a plan that combines dike reinforcements and spatial measures to achieve DP’s long-term flood safety objectives (2050–2100). The province developed the strategy, but it was subsequently rejected by the DP management as the strategy was too expensive, it had to be adjusted. A water manager explained that the preference strategy therefore became ‘a guiding compass’; a map of how much water level reduction could be achieved, instead of a decision.

Another water manager expressed critique towards the rejection of the preference strategy as it made it uncertain whether or not spatial measures in the strategy are going to be implemented. As a result, water boards do not know the water levels for which they need to reinforce their dikes to comply with new protection norms as some of these dikes are in locations where spatial measures are planned in the preference strategy.

Other respondents recognized this need to decide on whether or not spatial measures are going to be executed:

if you do not make arrangements, the water boards will understandably heighten the dike to the maximum necessary height. [...] But then you do not need spatial measures anymore, at least, not for the water level reduction targets. While you can achieve many other targets through spatial measures and it makes the river system more robust.

A water manager however explained that the costs to achieve the same level of flood safety through dike reinforcement is far lower than through spatial measures, adding: ‘The minister [of Infrastructure and Environment] takes a sober and effective approach, so you can imagine what the choice between dike reinforcement and spatial measures should be’.

Respondents did not display multiple perspective towards this challenge. For the most part, respondents displayed the hierarchist rationality towards this challenge, expressing predominantly positions such as expert norms as the primary motives for action, government regulation as management mechanism and water management focused on win-win solutions.

Resolution strategies to make decisions

In targeting this challenge, respondents also expressed the hierarchist rationality in their resolution strategies. Moreover, they all showed similar lines in their strategies. Overarching in all of these were the need to come to agreements on what measures are going to be taken. Specifically, the respondents stated that securing finances for long-term plans as one of the important aspects towards resolving the challenge. On this point, respondents advocated that the national government should make funds available for spatial measures to reach the requested agreement on measure implementation and provide water boards with the desired certainty. A respondent proposed to execute dike reinforcement and spatial measures projects as part of one organization in order to approach an area as one project instead of multiple projects in an area. In addition, this respondent would like to see more ‘rules of play’ for the DP plan-making similar to those that existed in RftR. Another respondent echoed

this view and proposed to formulate clear boundary objectives for decision-making, for water management, but also towards, for example, required nature development.

Discussion: the framing of challenges and divergent perspectives

In this research, Sense-making methodology and Cultural Theory (CT) were combined to identify the challenges and analyse respondents' perspectives. The application of Sense-making enabled respondents to put forward and construct the challenges, their perspectives towards these and possible resolution strategies themselves. CT subsequently enabled the analysis of how actors frame both the challenges and their resolution strategies by analysing the rationalities they used towards these situations. The combination proved to be a suitable approach to gain insight into and understand how issues and solutions are framed in integrated river basin management.

Moreover, the combination enabled the empirical assessment of the rationalities actors use in framing a situation, rather than confirming the researcher's beliefs (Billgren and Holmén 2008). Furthermore, the combination provided a methodology using the complementation of 'intensive explanation' and 'comparative generalizations'; an in-depth case study of a system and its actors and limited generalizations regarding identifiable patterns respectively (Morrow and Brown 1994, p. 211–212).

Divergent perspectives following the introduction of uncertainty

The identified challenges and divergent perspectives show how actors frame changes in integrated river basin management differently. Verweij *et al.* (2006) argue that at least three divergent perspectives exist that frame the issue – defining the policy problem and suggesting solutions – corresponding to the three active rationalities in CT. However, in the results presented in this paper, only one or two distinctive perspectives on each challenge were identified. This may be explained by the limited representation of private organizations in both Dutch river basin management and the executed interviews that could be expected to frame these challenges using the individualist rationality. According to Thompson (2008), uncertainty is a prerequisite for divergent perspectives to emerge. In all three challenges, new sources of uncertainty are added to existing integrated river basin management discourses asking for a response.

The challenge of creating flexibility in a controlled river system

The challenge of creating flexibility in a controlled river system relates to how newly created nature areas in the floodplains should be managed. In these areas, natural dynamics are allowed to run their course up to a certain extent. The unpredictable natural dynamics could however lead to an increase in hydraulic roughness of floodplains, adding uncertainty to flood safety management. In response, water managers frame the issue from the hierarchist rationality as needing to control the natural dynamics. Nature managers, on the other hand, frame the issue from the egalitarian rationality by focusing on allowing natural dynamics to run their course. In particular, water managers employ a fixation

point of view while permitting change – focusing on controllability – and nature managers take a development point of view based on natural processes – focusing on sustainability – which seems incompatible. Yet, both water and nature managers agree that water discharge is the main function of the floodplains. Similarly, they both consider the floodplains as controllable lands and agree that nature in the floodplains requires regulation. The challenge seems purely rooted in the execution of floodplain management and regulation of nature restoration, not in a split point of view on its necessity. These results are in line with Van de Bilt and Wiering (2006), who predicted that water and nature management in the Dutch floodplains could become a marriage where spouse clash in the daily housekeeping, particularly when the maintenance aspect of floodplains comes in. The challenge also reflects results of Fliervoet *et al.* (2013), who looked specifically at – as they defined it – the 'nature-safety dilemma' and showed that floodplain management actors are looking for more flexibility in river and nature policies. Moreover, they showed that the current static and conserving approaches in Dutch river basin management – exemplified in this paper by the vegetation layer – are not compatible with more adaptive floodplain management concepts.

The challenge of sustaining the integrated approach in the maintenance of floodplains

In the challenge of sustaining the integrated approach in the maintenance of floodplains, the introduction of public tendering to RftR added a market-oriented mechanism – associated with the individualist rationality – to floodplain management policy. Following this introduction, organizations now have to publicly tender for short-term contracts to manage the floodplain areas following the completion of RftR projects. As a result, it is no longer certain who or which organization would manage the floodplain areas. Governmental and nature managers rejected the introduction of public tendering as it introduced negative consequences towards their desire of pursuing sustainability, creating long-term outlooks and implementing pro-active strategies, framing the issue using the egalitarian rationality. Water managers, on the other hand, accepted public tendering as the new reality and looked for solutions that suit all involved while stressing that it is not their responsibility to pursue other goals such as nature development, framing the issue from both the hierarchist and fatalist rationalities.

Similar to the results presented here, Fliervoet *et al.* (2017) also noted the effects of public tendering to floodplain management. Through an unsuccessful pilot study on collaborative floodplain management, they showed that the public tendering was obstructing to establish collaborative arrangements and could possibly exclude nature management organizations. Furthermore, they showed that it leads to segregation of activities rather than integrated floodplain management.

The challenge of future river basin management policies to adapt to climate change

In the challenge of future river basin management policies to adapt to climate change, lack of specifications in the river component of the Delta programme (DP) in comparison to RftR added uncertainty towards taking decisions. Firstly, RftR's primary objective, increasing flood safety, had to be reached only using spatial measures unless this was not

possible. DP instead combines dike reinforcement and spatial measures to increase flood safety, but lacks specification on how much each should contribute.

Secondly, spatial quality was an objective fully paid for by the national government in RftR. Spatial quality is however not a DP objective and actors who want spatial quality developed are asked to financially contribute to DP projects. Combined, the lack of specifications has resulted in the postponement of decisions. A consequence feared by respondents is that water boards will execute dike reinforcement to maximum necessary height to meet the flood safety norms, making spatial measures unnecessary. The challenge therefore relates to lengthy decision-making and the need to come to decisions. The challenge however relates to taking decisions – it is less important what these decisions are – in order for all actors to know what they can expect.

The existing lack of specifications obstruct the respondents' desires of expert norms as the primary motives for action, government regulation as management mechanism and water management focused on win-win solutions. The respondents therefore all displayed the hierarchist rationality in relation to this challenge, whereas the other challenges displayed two perspectives each. This result may be attributed to a limited amount of respondents addressing this challenge in their interviews.

Alternatively, it may explain why the challenge exists in the first place. As noted by Van Asselt *et al.* (2001), the hierarchist water management style pursues win-win situations, but avoids making real choices. As a result, decision-making can get stuck in conferences and become sluggish. Schwartz (1991, p. 765) explains how the Cultural Theory's rationalities undermine themselves if left unchecked: 'Hierarchies, in turn, would be stagnant without the creative energy of individualism, incohesive without the binding force of equality, unstable without the passivity and acquiescence of fatalism'. The existence of the challenge may therefore be explained by the fact that the non-hierarchist rationalities are insufficiently represented.

A call for clumsiness and learning environments

In all challenges, divergent perspectives were socially constructed towards new situations in integrated river basin management following the introduction of new sources of uncertainty. That divergent perspectives exist in these situations is however inevitable and even desirable; it indicates that the challenges matter (Verweij *et al.* 2006). Verweij *et al.* (2006) furthermore explain that each perspective tells a plausible, but selective, story. It is therefore not a debate about which perspective is right or wrong: 'If you're having to ask who's right (worse still, if you already know who's right), you're wrong!' (Thompson 1997, p. 209). Formulating a response based on only one perspective will therefore be only a partial solution at best and an ineffective, counterproductive solution at worst. For all challenges, it is therefore necessary to develop suitable responses that make sure all actors' rationalities are taken into account and all actors have something to take home. Such responses where all rationalities are included and acknowledged by others are called 'clumsy solutions' (Verweij *et al.* 2006, Thompson 2008, Hartmann 2011).

The vegetation layer, discussed extensively in relation to the challenge of creating flexibility in a controlled river

system, is – in its current form – an example of a solution based on one perspective; it is not (yet) a clumsy solution. It is a typical command and control type of solution that satisfies water managers' desired hierarchist fundamentals, but fails to include nature managers' desired egalitarian fundamentals.

In order to develop clumsy solutions, the starting point to formulate policy responses should not be cost–benefit analysis or probabilistic risk assessment, but the understanding of the contending social framings of both the issue and the solution. (Thompson 1997, Verweij *et al.* 2006). New tools – classified as the 'other tool-kit' by Thompson (1997) – are therefore needed to enable actors to not only express their own perspectives, but also to recognize and understand those of others. Ignoring these contending frames may lead to conflicts remaining unresolved (Mostert *et al.* 2008).

In essence, these new tools should bring actors together and focus on representing multiple sides of a problem rather than being a problem-solving activity. Such tools should be designed to facilitate learning environments.

In learning environments, actors meet, interact and learn both from and about each other through collaboration (Keen *et al.* 2005). Learning environments therefore support actors to understand the diversity of frames used in decision-making processes in order to help resolve conflicts and formulate collective action (Keen *et al.* 2005, Pahl-Wostl *et al.* 2007). This way, learning environments are able to facilitate the interaction and exchange of perspectives between actors. Ultimately, these environments should contribute to improving the efficiency, effectiveness, and democratic legitimacy of decision-making (Sørensen and Torfing 2017).

As a next step, a serious gaming environment – a learning environment facilitated through a serious game – will be developed together with actors in a case study. A serious gaming environment is seen as a suitable method for river basin management actors to collaboratively explore challenges and debate responses under the inherent uncertainties found in integrated river basin management (Valkering *et al.* 2012). In the serious gaming environment, players can play a role in integrated river basin management other than their own in a safe environment – a game – making them familiar with other perspectives. The empirical results of the paper, the identified challenges, perspectives, and resolution strategies, will inform player roles as well as game rules and options. This way, the serious gaming environment provides the necessary ingredients for 'policy-oriented learning' as actors have – and are in a way forced – to consider other perspectives (Sabatier and Jenkins-Smith 1993) and 'social learning' as it facilitates an inclusive, communicative, and participatory process where actors can exchange perspectives (Koppenjan and Klijn 2004, Keen *et al.* 2005, Rist *et al.* 2006).

Conclusion

The research presented in this paper aimed to identify shared challenges that actors experience in integrated river basin management as well as the actors' perspectives towards these challenges. The objective was to gain a better understanding of how issues and solutions are framed in integrated river basin management differently by involved actors. Combining Sense-making and Cultural Theory proved a suitable approach to gain this understanding. A strength of the

approach is that it enabled an in-depth case study focused on the 'world' of the respondent rather than the researchers, while able to make generalizations. The combination could be a useful approach towards understanding how actors frame issues in contested policy areas other than river basin management as well. To utilize its full potential however, it is important to make sure all voices are represented in the study.

Three challenges in current Dutch integrated river basin management were identified in the study. In the challenges, particularly in the creating flexibility in a controlled river system and sustaining the integrated approach in the maintenance of floodplains challenges, respondents framed both the issue and solution differently. Further analysis showed how actors use different rationalities in constructing perspectives following the introduction of new sources of uncertainty. Moreover, the analysis showed how existing policy responses towards the challenges are based on only a single perspective and insufficiently incorporates those of others. These results reflect the management and governance complexity of integrated river basin management. River basin management actors have to deal with both the issues at hand and the divergent – and at times conflicting – perspectives of other actors towards these issues.

It is therefore important for actors to consider and include these perspectives in integrated river basin management decision-making. Failure to recognize and acknowledge the existence of contending perspectives can result in conflicts remaining unresolved. Current tools like cost–benefit analysis or probabilistic risk assessment ignore this essential aspect in the decision-making process. New tools are therefore needed that facilitate actors to express their own perspectives and help to recognize and understand the perspectives of others. These tools should not focus on problem-solving, but should facilitate the exploration of multiple sides of an issue. Furthermore, such tools should be designed for and embedded in learning environments to facilitate collaboration and the exchange of perspectives between actors.

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Appendix. Cultural Theory beliefs and positions in relation to river basin management.

Belief	Hierarchist position	Egalitarian position	Individualist position	Fatalist position	Source
<i>General beliefs and positions</i>					
Position of man	Man partially dominates nature	Man is part of nature	Man dominates nature	Man has no influence on nature	Thompson <i>et al.</i> (1990)
Primary motives for action	Expert norms	Collective interests	Self-interests	Surprises	Thompson <i>et al.</i> (1990)
Myth of nature	Tolerant (disturbances have effect, but are not uncontrollable)	Fragile (disturbances break the fragile dynamic equilibrium)	Robust (disturbances have effect, but are of minor importance)	Capricious (disturbances have unknown effect, nature is random and unpredictable)	Thompson <i>et al.</i> (1990); Hoekstra (1998)
Risk	Risk-acceptance	Risk-averse	Risk-seeking		Thompson <i>et al.</i> (1990)
Risk-handling style	Institutionalization	Reduction	Taking the opportunities	Acceptance	Hoekstra (1998)
Salient risks	Loss of control	Catastrophic developments	Threats to the free market	Surprises	Hoekstra (1998)
Management style/philosophy	Control, regulatory	Prevention	Adaptation	Passive	Thompson <i>et al.</i> (1990); Hoekstra (1998)
Management objectives	Social stability and safety	Environmental protection and equity	Economic growth and self-realization	No objectives, adjust to changes	Thompson <i>et al.</i> (1990)
Management mechanism	Government regulation	Participatory decision-making	Free market	No preference, does not matter anyway	Thompson <i>et al.</i> (1990)
Management responsibility	National & European governments	Regional governments & NGOs	Private sector & individuals	Individuals make their own decisions	Valkering <i>et al.</i> (2011); Offermans (2012)
Important values	Structure & stability	Harmony & solidarity	Freedom & independency	Comfort & pleasure	Offermans (2012)
Rationality	Procedural	Critical	Substantive	Fatalistic	Hoekstra (1998)
Knowledge	Almost complete, organized	Imperfect, holistic	Sufficient, timely	Irrelevant	Hoekstra (1998)
Needs	Given, unmanageable	Social, manageable	Individual, manageable	Unmanageable	Hoekstra (1998)
Resources	Scarce, manageable	Depleting, unmanageable	Abundant, manageable	Lottery, unmanageable	Hoekstra (1998)
Learning style	Anticipation	Trial without error	Trial and error	Luck	Hoekstra (1998)
Desired system's properties	Controllability	Sustainability	Exploitability	Capability	Hoekstra (1998)
System response	Re-active (defensive strategies)	Pro-active (preventive strategies)	Opportunity seeking	Cope with surprises	Hoekstra (1998)
Ideal scale	Large	Small	Appropriate	No preference	Hoekstra (1998)
Climate change (attitude)	Climate is sensitive, changes must be expected, additional research is required	Climate is very sensitive, large changes must be expected	Climate is insensitive, some changes must be anticipated	Climate may change or not, what will be will be ^a	Middelkoop <i>et al.</i> (2004)
Climate change (expectation)	Average trend	Extreme trend (worst-case)	Low trend (best-case)	Not identifiable	Valkering <i>et al.</i> (2011); Offermans (2012)
Socio economic development	Average growth	Weak growth	Strong growth	Not identifiable ^a	Valkering <i>et al.</i> (2011)
<i>River basin management specific beliefs and positions</i>					
Water	Manageable resource	Public property	Economic Good	Water is given to the rich	Hoekstra (1998)
Water problems vs manageability	Serious problem, but manageable	Serious problem, not manageable	No problem	Useless to consider	Offermans (2012)
Value of water	Diversity of functions	Well-being	Welfare	Comfort & pleasure ^a	Valkering <i>et al.</i> (2011)
Water supply	Demand-driven	Supply-driven	Market-driven	Remain the same, useless to consider	Hoekstra (1998); Offermans (2012)
Water priorities	Preservation of current function	Compensation & ecology	Innovation & economy	Comfort & providing individual with enough supply	Offermans (2012)
Water system organization	Control & regulation	Nature development & resilience	Opportunism & innovative technologies	Passive, interference is useless	Valkering <i>et al.</i> (2011); Offermans (2012)
Water management	Sustainable water management, win-win solutions and negotiations, time horizon varies depending on function (10–50 years)	Pro-active, sustainable water management with long-term horizon (> 50 years)	Short time horizon planning (10 years)	Enjoy water here and now (no outlook) ^a	Middelkoop <i>et al.</i> (2004)
River function priority	Safety has priority	Society will adapt to environment, not vice versa	Environment can be exploited for economic use	Comfort & pleasure have priority ^a	Middelkoop <i>et al.</i> (2004)

(Continued)

Appendix. Continued.

Belief	Hierarchist position	Egalitarian position	Individualist position	Fatalist position	Source
Floodplain function priority	Discharge of water	Nature and space	Prosperity	Pleasure ^a	Valkering <i>et al.</i> (2012)
Floodplains	Controllable land; engineering solutions based on regulations, rules and norms	Dangerous land; landowners must be protected	Profitable land; free choice of land use	Inconspicuous land; floodplains are just land that require no special attention	Hartmann (2011)
Floodplain management	Command and control; certain thresholds may not be exceeded (thus: building regulations, technical norms)	Retraction and protective measures	Innovative and risky approaches (e.g. floating homes)	Flood risk cannot be controlled, accept risk and make the best of it	Hartmann (2011)
Perspective on nature	Regulation of nature	Prevention and treat ecosystems with great care	Nature is benign	Enjoy nature ^a	Thompson <i>et al.</i> (1990); Offermans (2012)
Approach to nature	Nature is vulnerable, but can be managed by defining adequate standards	Nature is vulnerable	Economy is more important than nature	Nature is unpredictable ^a	Thompson <i>et al.</i> (1990); Middelkoop <i>et al.</i> (2004)
Nature management	Based on standards	Natural processes are guiding	Cost–benefit analysis and economic risk assessment guide water management	No policy ^a	Middelkoop <i>et al.</i> (2004)
River nature (development)	Conservation	Compensation & ecology	Exploitation	What will be, will be ^a	Valkering <i>et al.</i> (2011)
Land use (spatial planning)	Water follows; preservation of existing space	Water is guiding; functions follow water, give up space if necessary	Water offers opportunities; functions utilize water, creation of space on water	Water should be used for comfort & pleasure	Valkering <i>et al.</i> (2011); Offermans (2012)
Flood risk	Flood risk levels vary depending on the development of area (divergent risk levels)	Flood risk levels are equal for all locations (equal risk principle)	Flood risk levels reduction based on economic trade-offs (economic trade-offs)	Flood risk levels are irrelevant; accept flooding may occur (risk-acceptance)	Hoekstra (1998)
Flood safety	Flood prevention	Avoid flood-prone areas	Adaptation and innovation	Interference is useless	Valkering <i>et al.</i> (2011)
Damage due to flooding	Should be prevented, otherwise refunded by the government	Matter of solidarity; everyone is financially responsible	Matter of individual responsibility; known risk of living in flood-prone areas	Why bother to consider before it happens	Offermans (2012)
Response to drought	Following guidelines & laws	Fair distribution between nature and human consumption	Market forces; rising prices in times of scarcity	Why bother to consider before it happens	Offermans (2012)
Level of integrality	Sectoral	Integral	Competition	Irrelevant ^a	Valkering <i>et al.</i> (2011)
Decision-making based on	Norms & expert knowledge, research	Participatory processes with input of all stakeholders	Functioning of free market and privatization (cost–benefit analyses)	No decision-making, waste of time	Valkering <i>et al.</i> (2011); Offermans (2012)
Time outlook	Mid-term	Long-term	Short-term	Now	Offermans (2012)
Identity and knowledge	National identity & traditional export product	Catchment identity & solidarity	International identity and innovative image	Individuals own identity and pleasure	Valkering <i>et al.</i> (2011); Offermans (2012)
Flood acceptability	Low	High	Medium	Why bother ^a	Offermans (2012)
Flood damage acceptability	Medium	High	Low	Why bother ^a	Offermans (2012)
False alarms acceptability	Low	High	Low	Why bother ^a	Offermans (2012)
Shipping suitability	Medium	Low	High	Why bother ^a	Offermans (2012)
Nature area and diversity	Medium	High	Low	Why bother ^a	Offermans (2012)

^aIn some publications, the fatalist positions were excluded from the study as the fatalist perspective withdraws from policy-making. For these publications, the fatalist position is not taken from the source, but derived from Cultural Theory.